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THE AQUATIC CATERPILLARS OF LAKE QUINSIGAMOND.

By Wm. T. M. Forbes.

Worcester, Mass.

Lake Quinsigamond is situated in the center of Massachusetts, on the boundary between Worcester, Shrewsbury, and Grafton. It is long, resembling a river, with a number of shallow inlets, especially along the east shore. The main part of the lake is clear of vegetation, and most of the inlets have been disturbed by man, but beyond the "Stringer Dam," which cuts off the southeast corner, and in Flint's Pond, which is in all but name the south end of the lake, the water is mostly only three or four feet deep, and overgrown with the water lilies, Nymphæa and Castalia, Floating Shield, Floating Heart, Pond-weeds, Bladderworts, Pickerel weed, Elodea, and many other plants. This part swarms with Nymphulæ, of the following species:

N. maculalis, common especially over waterlilies, but flying freely and often found even on shore; also ab. *masculinalis.*

N. seminealis, equally common where Limnanthemum (Floating Heart) is dominant.

N. obscuralis. A single specimen.

N. allionealis, rather rare, and found only at a single spot, on the north shore of "Cuba" Island.

N. badiusalis, earlier than the preceding, except perhaps the last, and found mostly nearer shore; not very common.

N. gyralis, common, especially in Flint's Pond.

N. icciusalis, quite common.

Pyrausta nelumbialis, not common.

Larvæ were found of four species; maculalis and seminealis in large numbers, two of gyralis (?); and one of icciusalis.

Generic characters of the caterpillar. *N.* (*Nymphœella*) *maculalis* may be taken as a type, but *obscuralis* and *gyralis* (?) were compared, also *nymphœata* of Europe. Head somewhat wider than high; small compared with width of body; front somewhat higher than wide, reaching more than two-thirds way to the vertex; the setæ far apart and high up, the punctures only a third as far apart as the setæ, and much lower; adfrontals slender, not entirely well defined from the epicrania; reaching vertex, but not quite completely separating front from epicrania below, with setæ close together and decidedly below the puncture. Labrum with *ii* rather higher than *i*, *iii* much below *iv*, moderately notched. Epicrania with *ii* near to adfrontals; with five ocelli, the posterior one being wanting. Antennæ with second joint four to seven times as long as wide, longer in Nymphæella and Paraponyx than in Hydrocampa, with one seta at about two-thirds its length, the long seta only about three-fifths as long as the joint; third and fourth joints equally long. Body very variable in shape in life, when preserved, short and broad, with tracheal gills in the subgenera Nymphæella and Paraponyx. Ventral prolegs rudimentary, with an ellipse of crotchets, alternatelyof two or three lengths, hardly interrupted in the first two genera, but broadly interrupted at the inner and outer ends in Hydrocampa. Anal prolegs with an ellipse of hooks in the former, broadly interrupted behind; in the latter, a single short straight band.

Spiracles of segments A2, 3, and 4, enlarged, the others rudimentary.

1. *N.* (*Nymphœella*) *maculalis* was very common wherever either of the waterlilies grew, and for some distance about on the shore males were plentiful. The male varied but little; but of the female, beside the typical ash-gray form some were pale brown, marked almost as in female *obscuralis* or with dark bands; some were gray with paler costa; and one or two white, with a few fragments of black lines (ab. *masculinalis*). Plenty of caterpillars were bred; and they are undoubtedly those noted by Dyar as *gyralis* (?).

The caterpillar forms a nest on leaves of the two waterlilies, Castalia and Nymphæa (Nuphar), and also on Brasenia, by cutting out a piece of the margin, and attaching it by silk to either the upper or under surface of the leaf. This nest is a broad oval, and when full sized is about an inch to an inch and a half long, and forms a rounded hump in the leaf when on the under side. (These were caterpillars of the first brood, in July.) When taken into the house, into warmer water, they mostly cut out the portion of leaf on which their nests were made, and so made of then portable cases, much like those of *N. gyralis*, but filled with water. Pupation took place in the last nest, which was lined with a translucent layer of silk, and then showed a distinct central ridge from the outside. If the caterpillar was in a portable case (in the laboratory), it was anchored to the edge of a leaf. Late in August young caterpillars about an eighth of an inch long, or a little larger, had the same habits, but very soon the cases were cut away, as happened with the first brood in the laboratory, and the caterpillars were found to be only on the young submerged leaves. Apparently when very young they eat one epidermis and the parenchyma of the parts of the leaf forming their nests, but by the time they are a quarter of an inch long they feed only outside of the nest which is of uninjured pieces of leaf.

Eggs were laid in captivity, but not in a regular egg-mass. They were oval and flattened; .65 x .5 mm., and had no decided longitudinal ridge. Duration of stage about ten days.

Stage I. (From these eggs.) Slightly larger than N. gyralis? described below, with proportionately much larger anal setæ, without a trace of gills. Head nearly .3 mm.; length of large anal setæ 1 mm.

Stage II. Not seen; and no sign of leaf-mining was noticed.

Stage III (?). A transparent caterpillar, essentially like the full-grown ones. The maximum number of gill-filaments is two, and the anterior suprastigmatals and the last three pedals have but one. Length about 4 mm.; head .6 mm.

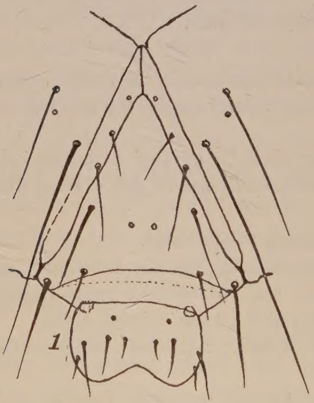
Stage IV. Length 4 to 6 mm.; head .4 to .56 mm.; maximum number of gill-filaments three.

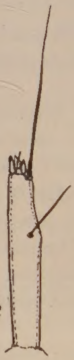
Stage V. Length 6 to 10 mm.; head 1 to 1.5 mm.; maximum number of gill-filaments four. (Possibly two stages are confused here, or the wide range in size of head may be sexual.

Last Stage. Length fully extended may reach 25 mm.; head 1.5 mm. Transparent, the only appearance of marks being due to the internal organs showing through. Head pale chitin-yellow, with darker mouth-parts. The gills are 100 in number, each with from two to five filaments, as shown in the diagram.

Segments.	T2	3	A1	2	3	4	5	6	7	8	9
Anterior suprastigmatal	5	5	4	4	4	4	4	4	3	3	–
Posterior suprastigmatal	3	4	5	5	5	5	5	4	4	4	–
Lateral	3	3									
Anterior infrastigmatal			3	5	5	5	5	5	5	4	4
Posterior infrastigmatal	5	5	5	5	5	5	5	5	5	5	
Pedal	–	5	5	5	5	5	4	4	4	3	–

The characters that distinguish *N. maculalis* from *N. obscuralis* are, then, the equal number of filaments on the anterior and posterior infrastigmatals, and the fact that the seventh abdominal segment has one less pedal gill-filament than the more anterior ones. The filaments are also proportionately longer and the unbranched basal portion is longer. These characters will hold at least as early as the stage with two gill-filaments. From *Hydrocampa gyralis* (?) and *icciusalis*, it can be easily distinguished by the gills, and also by the spiracles, of which those on segments, 2-4, of the abdomen are equal, but minute (the size of the smallest in *N. gyralis* (?); and that of the first segment and the posterior ones are equal and rudimentary. The caterpillar becomes pale yellow just before pupation. Food Nymphæaceæ.





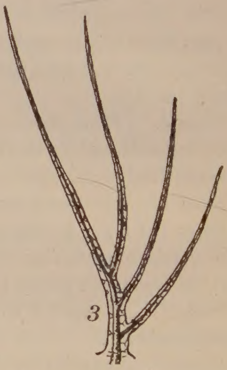


Fig. 1. Front and labrum of *Nymphula maculalis*.
Fig. 2. Antenna of *N. maculalis*.
Fig. 3. Tracheal gill of Nymphula.

Pupa similar in general form to that of obscuralis, as described by Dyar, but of the seven ridges near the tip of the abdomen beneath, only the central one remains, and the anal opening is not distinctly Y-shaped. The case for the hind legs varies considerably in length.

2. *N. seminealis*. Was not quite so common as the last; and the males did not rove as widely. No specimens were taken far from Limnanthemum.

♂. Whitish, powdered with dark brown, giving a chocolate brown effect. Transverse posterior line broad, even and white, strongly contrasting; running from the costa to the submedian space, and then turning inward as far as the middle of the wing; preceded by an equal band of brilliant bronze. Subterminal fine, even, black, not reaching either costa or inner edge, and preceded by a broader line of grayish white. Subterminal space dark bronze; terminal space tawny, with a golden reflection. Fringe lead-colored. Hind wing not differing from that of the female. The wings are rather broader.

♀. Groundcolor, dull tawny brown, about the color of the subterminal space of the male, but not brilliantly bronzy. T. p. band grayish, not contrasting, subterminal line preceded by a less brilliant gray band; wings narrower.

Seminealis is an exceedingly close relative of *N. obscuralis* and *badiusalis*, and if *juncealis* is equally close, as Guénée's figure would suggest, Oligostigma will have to be widened to include the two former species, and will at best be a very subordinate subgenus of Nymphula, group Paraponyx. The slight truncation of the hind wings, given in the definition of Oligostigma, is shared by the other two. *Vittatalis* and the East Indian species have, however,[1] quite a different appearance.

Caterpillars were common, and were bred through. They come nearest to those of *N. obscuralis*, described by Hart, but the adult caterpillar has but four filaments to a gill, while *maculalis* has six. They have also a different food-plant; and none were found on Potamogeton which is common intermingled with the Limnanthemum. Four stages were seen, and the first was probably missed, as the head of the smallest found was too large for a normal Nymphula egg. It will probably resemble those of *maculalis* and *gyralis* (?) and be without gills.

Stage II. Maximum number of filaments one; width of head 4 mm. At this stage the caterpillar is a leaf-miner, lying close to the lower epidermis, and forms a somewhat trumpet-shaped mine.

Stage III. Maximum number of filaments two, the anterior subdorsals and stigmatals with but one; head .7 mm. The caterpillar now removes the lower epidermis as well as the parenchyma, and covers itself with a fragment of leaf. It forms a path continuous with its previous mine.

Stage IV. Maximum number of filaments three; head .9 mm. A case is now formed between a leaf and a piece cut out, or between two neighboring leaves. The red lower surface is eaten in a series of bands within the nest, forming a very characteristic marking; a habit which persists till the caterpillar is full grown, unlike maculalis, which after an early stage does not feed within the nest.

Last Stage. Maximum number of filaments four; head 1.3 mm. Habits as in the preceding stage, but the case is more often made between two complete leaves, or is occasionally detached and carried about, especially in captivity. In my full grown caterpillars the filaments were arranged as follows:

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[1] I am indebted to Mr. W. D. Kearfott for the opportunity of seeing specimens of this genus.

Segment.	T2	3	A1	2	3	4	5	6	7	8	9
Anterior suprastigmatal	4	4	3	3	3	3	3	3	3	3	–
Posterior suprastigmatal	3	3	4	4	4	4	4	4	4	3	–
Lateral	2	3									
Anterior infrastigmatal			3	3	3	3	3	3	3	3	3
Posterior infrastigmatal	4	4	4	4	4	4	4	4	4	4	
Pedal	–	4	4	4	4	4	4	4	4	3	–

From *N. maculalis* it may be distinguished by the fact that the anterior infrastigmatal has constantly one less filament than the posterior; and that the number of filaments in the pedal row is not reduced until the last one if at all. This distinction holds in the two-gilled and all later stages, and also applies to the other members of the subgenus, *obscuralis* and *stratiotata.*

Food Limnanthemum; will eat Potamogeton in captivity.

The pupa seems identical with that of *N. obscuralis*; but the hind-leg case is quite variable, sometimes as long as the body.

3. *N. obscuralis.* I have a single specimen of this species, caught at Worcester, but probably not coming from Lake Quinsigamond.

Ground color, whitish powdered with black-brown like male *seminealis*, but even duller, the powdering forming a darker median shade. T. p. line white, narrow, forming deep inward cusps opposite apex of cell and on vein 4, lost below vein 4; subterminal space rather warmer brown, but terminal space concolorous. Subterminal line sharply and deeply serrate on the veins. Wings entirely without bronzy reflections, but the hind wing is marked exactly as in *N. seminealis.*

4. *N. badiusalis.* Not common, with *N. allionealis*, and nearer shore. The caterpillar may possibly feed on some submerged plant.

5. *N. allionealis.* Not common, and only in a single station. Judging by the related European species *stratiotata* the caterpillar will feed on such a plant as Elodea, and will have one more filament in the posterior subdorsal gills than in either of the infrastigmatals.

6. *N. gyralis.* Was common enough, especially in Flint's Pond, to the south of the lake proper. It was the only member of its group (typical Hydrocampa) that was seen at the lake, so I place

with it, with some doubt, the following early stages. At any rate they do not seem to belong to the described species, *N. obliteralis.* The larvæ noted by Dyar as perhaps of this species are almost certainly those of *N. maculalis.*

Eggs. The eggs were quite like those of N. obliteralis, as described by Hart; .55 x .4 mm.

Stage I. (From these eggs.) Head dark brown, body pale yellow, not differing from the adult; without gills. Setæ proportionately longer than later, especially those at the posterior end, the subprimaries absent. Prolegs with fifteen crotchets, all of the same length, in a transverse ellipse. The alternation of lengths evidently appears with the second stage in Nymphula. Tracheæ empty. The head seems about the same as later in structure, but the antenna apparently lacks the terminal joint. Length at hatching 2.5 mm.; diameter of head .2 mm. They all died without eating, though provided with leaves of Nymphæa and Limnanthemum (laid on the latter), but they gathered on the Nymphæa leaf in numbers. Possibly in the first stage they may feed on submerged stems. Immediately on hatching they scattered and swam toward the light, spinning a tangle of silk threads.

Full-grown caterpillar. The full grown caterpillar is found in a nearly circular case, formed of two pieces of leaf of the yellow waterlily. It was large and roomy, and one piece of leaf was much larger than the other. It was filled with air. Before pupation the case was cut down to a diameter of less than 12 mm., and was more densely lined with silk. It was left freely floating. The caterpillar did not differ in structure from that of *N. obliteralis* (Dyar); with crotchets of ventral prolegs widely interrupted inwardly and outwardly; and anal prolegs with a single short bar of 12 crotchets. It was pale yellow, with light brown head without any dark band. The first abdominal spiracle was considerably larger than the fifth, and the second was intermediate in size between the first and the third. Diameter of head 1.25 mm.

Pupa. Deeper, brighter yellow than that of *N. maculalis* and *N. obscuralis,* the first of the open spiracles somewhat smaller than the other two. The hind leg cases reach but one third way to the tip of the body; the anal end apparently without any decided modification.

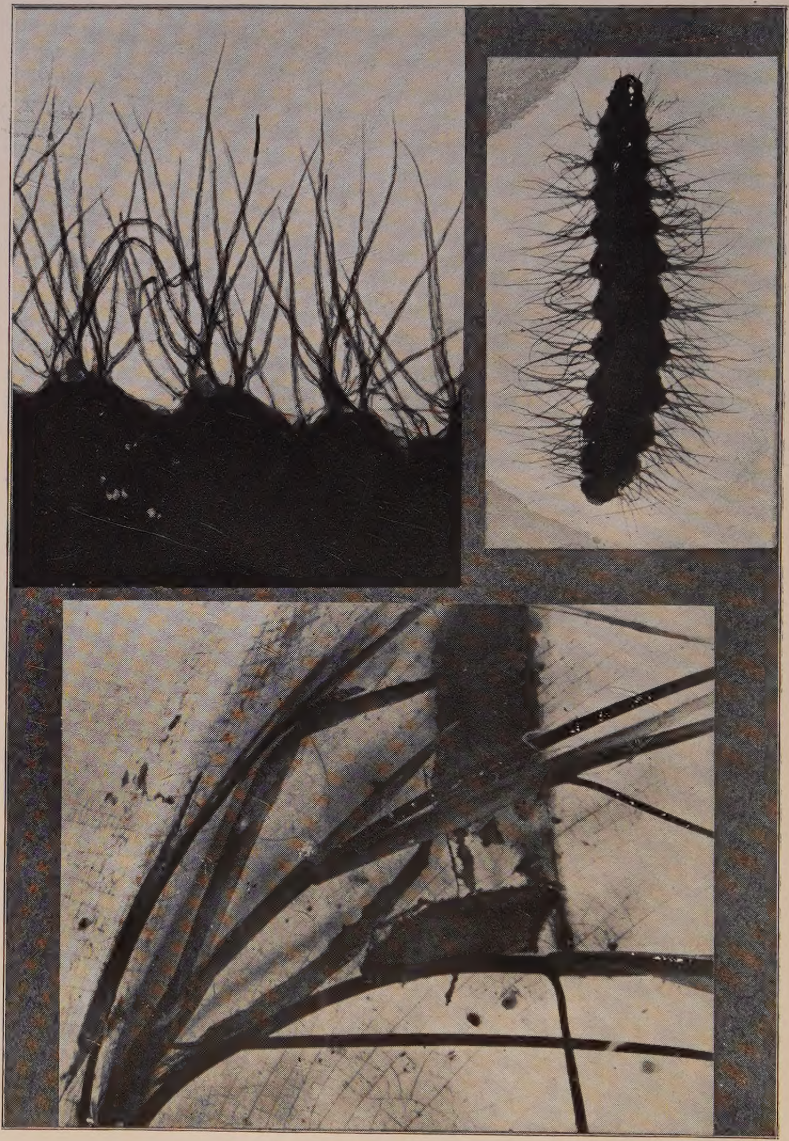
7. *N. icciusalis.* I had the good fortune to breed through a single specimen of this species, which was described, with some doubt, by Packard in the American Naturalist, xviii. The caterpillar is as described by him, so far as my notes go, with blackish brown head, and dirty gray body. It makes a case with decidedly rectangular shape, living the entire last stage and pupating in a single case. The figure by Packard exactly resembles my specimen. The caterpillar is extensible, like that of the other Nymphulæ and Packard's figure would represent it in full extension; when retracted it is no slenderer than the others. Before pupation the

case is anchored beneath the water on the submerged stem, and remains there. The moth evidently swims or walks up through the water before expanding, and so is more or less amphibious. My specimen was found on *Potamogeton*, in comparatively deep water, and did not eat Limnanthemum, so far as I could tell, though that is much more closely related to the food plant that Packard reported, Menyanthes. It was quite surprising to find that this moth, the one generally found nearest shore, had a caterpillar just as aquatic as that of *gyralis;* and a pupa that is actually submerged.

8. *Pyrausta nelumbialis.* The caterpillar was found on yellow pond lily; in the top of the petiole.

SYNOPSIS OF THE AQUATIC NYMPHULINE CATERPILLARS.

- With tracheal gills; second and third abdominal spiracles equal
  - Anterior and posterior infrastigmatal gills with the same numberof filaments............................(subgenus **Nymphæella** Grote)
    - Maximum number of filaments five; on Nymphæaceæ.......**N. maculalis**
  - Anterior infrastigmatal gills with one less filament
    - Posterior subdorsal gills with one more filament than infrastigmatals..............................(subgenus **Paraponyx** Hübner)
      - *N. stratiotata* of Europe and probably **N. allionealis** of America
    - Posterior subdorsal, and infrastigmatal, and pedal gills with the same number of filaments.................(subgenus **Oligostigma** Guénée)
      - With a maximum of six filaments in adult; usually on Vallisneria .... **N. obscuralis**
      - With a maximum of four filaments; usually on Limnanthemum.................................... **N. seminealis**
      - Unknown .... **N. badiusalis**
- Without tracheal gills
  - Second abdominal spiracle decidedly smaller than the third; stout and flattened; head darker than body (subgenus **Hydrocampa** Latreille)
    - Head dark chitin-yellow; in a nearly circular case
      - Body whitish; thoracic tubercles more distinct than abdominal ones; head with a lateral dark brown stripe; on Potamogeton... **N. obliteralis**
      - Body pale yellow; tubercles all similar; head without dark brown except in mouth-parts; on Nuphar (Nymphæa)...**N. gyralis** (?)
    - Head dark brown; body dirty gray; in an oblong case on Potamogeton and probably Menyanthes....................... **N. icciusalis**
  - Cylindrical and moniliform; head paler than body; forming a cylindrical or ellipsoidal case of a mosaic of Lemna plants............**Elophila**
    - The American species have not been described.



FORBES--AQUATIC CATERPILLARS.

Fig. 4. Tracheal gills of penultimate stage of *N. maculalis,* photomicrograph.

Fig. 5. Penultimate stage of *N. maculalis* seen by transmitted light; alive but stupefied with chloratone.

Fig. 6. Cocoon of *N. icciusalis* on submerged stem of Potamogeton; enlarged about two times.

Synopsis of the Pupæ of Nymphula.

- The three open spiracles equal in size; ninth abdominal segment with a median longitudinal carina below.
  - With but one median longitudinal carina ....(subgenus **Nymphæella**
    - Cocoons on Nymphæaceæ.............................. **N. maculalis**
  - With seven longitudinal carinæ on a transverse ridge....(subgenus **Paraponyx**
    - Cocoons floating
      - on Vallisneria, etc....................**N. obscuralis**
      - on Limnanthemum................. **N. seminealis**
    - Unknown, possibly submerged..........**N. badiusalis** and **N. allionealis**
- The first open abdominal spiracle distinctly smaller than the other two; no distinct median carina on ninth segment below...... (subgenus **Hydrocampa**
  - Cocoon floating, nearly circular
    - Pupa pale yellow; first open spiracle much smaller than the other two; Potamogeton........................... **N. obliteralis**
    - Pupa bright yellow; first open spiracle hardly smaller than the other two; Nymphæa............................. **N. gyralis** (?)
  - Cocoon submerged, oblong; first open spiracle much smaller than the other two; on Potamogeton and Menyanthes..........**N. icciusalis**
  - Unknown.. **N. ekthlipsis**

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SOME ADDITIONS TO THE DIPTERAN FAUNA OF NEW ENGLAND.

By Charles W. Johnson.

Boston Society of Natural History.

Pogonosoma dorsatum Say.

A specimen of this species was obtained by Mr. F. A. Sherriff at the base of Mt. Washington near Fabyan, N. H., July 7, 1910. I am not aware that the species has been collected east of the Rocky Mountains since it was described by Say from "near Philadelphia." It has been recorded from Washington (Williston) and Idaho (Aldrich). Specimens are in the writer's collection from Bear Creek Cañon, Colo., June 8, 1897 (Oslar), and Estes Park, Colo., July, 1892 (Snow).

Pogonosoma melanoptera Wiedemann.

In the collection of the American Museum of Natural History is a specimen of this species collected by Prof. W. M. Wheeler at Woods Hole, Mass., July 18. The distribution of the species would indicate an austral form. It has been recorded from Florida (Williston), South Carolina (Schiner), Maryland (Mus. Comp. Zool.) and New Brunswick, N. J. (Dr. J. B. Smith). Specimens are in the writer's collection from Alabama, Pendleton, N. C., June 7, 1895, and Philadelphia, Pa., July 5, 1898.

Ceraturgus nigripes Williston.

One specimen collected on the side of Mt. Equinox, near Manchester, Vt., June 5, 1910, at an elevation of about 2,000 feet. The specimen agrees with the description of *C. nigripes*, except in two minor details. The wings are not "pure hyaline," but grayish with a distinct brownish tinge along costa and the outer half. The legs of *C. nigripes* are described as "pitchy black, the tibiæ and tarsi fulvous pubescent," while in this specimen the femora only are "pitchy black," the tibiæ and tarsi yellow, all the joints of the latter annulated with black, with an apical band of black on the tibiæ. In the closely allied species *C. cruciatus* Say, the color of the legs is extremely variable. There seems therefore to be little doubt but that this represents only an extreme variation of *C. nigripes* although the species has not been recorded north of the Black Mountains, N. C.

Phthiria borealis n. sp.

Black, covered with a dense yellowish gray pollen; the frontal orbits, occiput, humeri, scutellum and a narrow posterior margin on the abdominal segments, dull yellow; antennæ and proboscis black, the latter slightly more than double the length of the head; legs black, tips of the coxæ and femora yellow; halteres light yellow with a brown spot on the side of the knob. Wings pure hyaline. Length 3.5 mm.

Type ♀, Fort Kent, Maine, August 7, 1910. Two specimens were also collected by Dr. J. A. Cushman at Little Black River Rapids, Maine, September 13, 1907. This is the most northern representative of the genus thus far discovered in North America.

Phthiria sulphurea Loew.

A specimen of this species from Horse Neck Beach, Mass., collected August 9, by Dr. G. de N. Hough is in the collection of the American Museum of Natural History.

Phthiria coquilletti Johnson.

Two specimens were collected by Dr. J. A. Cushman on Nantucket, Mass., July 4, 1906. They are slightly smaller than the types from southern New Jersey.

Phthiria cyanoceps Johnson.

In addition to the type locality (Cohasset, Mass.) this species has been taken at Barbour's Heights, R. I., September 19, 1908, by Prof. John Barlow.

Chalcomyia aerea Loew.

This interesting species was taken at Auburndale, Mass., May 8, 1905. I have also collected it near Clifton, Delaware County, Pa., May 5, 1895, on an old log in the bright sunlight.

Brachyopa vacua Osten Sacken.

Cohasset, Mass., June 5, 1904 (Owen Bryant). It has also been taken at North Saugus, Mass.

Brachyopa media Williston.

A specimen was captured on the summit of Mt. Greylock, Mass., June 15, 1906; on the flowers of the wild cherry. Mr. E. J. Smith also collected a specimen at Sherborn, Mass. A peculiar variation of this species, in which the abdomen is entirely black, was obtained by Mr. E. Daecke at Castle Rock, Delaware County, Pa., May 19, 1901.

Sphegina campanulata Robertson.

This species seems to be quite generally distributed throughout New England:—Branford, Conn., May 25, 1905 (Rev. H. W. Winkly); Hampton, N. H., June 25, 1908 (S. A. Shaw); Machias, Maine, July 17–22, 1909 (C. W. Johnson).

Xanthogramma tenuis Osburn.

A single example of this western species was obtained by the writer at Ethan Allen Park, Burlington, Vt., June 24, 1906.

Eumerus strigatus Fallen

Pipiza strigata Fall., Dipt. Seuc. Syrphici, 61, 8, 1817.
Eumerus grandicornis and *funeralis* Meigen, Syst. Beschr., III, 208, 1822.
E. lunulatus and *planifrons* Meigen, Syst. Beschr., III, 209, 1822.
E. æneus Macq., Soc. Sci. Lille, 1827, p. 269; Hist. Nat. Ins. Dipt. I, p. 528, 1834.

Two specimens of this European species have come under the writer's observation. The first was obtained at Brookline, Mass., June 1909; the second was received from Mr. M. C. Van Duzee who collected it at Buffalo, N. Y., June 3, 1908. The genus has not been recorded from America, but the presence of this species in such widely separated localities seems to preclude the possibility of recent introduction. The above synonymy is that given (in part) in the Katalog der Paläarktischen Dipteren, III, 137.

Xylota (?) tuberans Williston.

This interesting species has been collected at a number of places during the past few years: Squam Lake, N. H., June 22, 1907 (Dr. G. M. Allen); Mt. Equinox, Manchester, Vt., June 5, 1910.

Hypoderma bovis De Geer.

The ox-bot seems to have been unusually prevalent the past season. Mr. Wm. Merrill of West Newbury, Mass., in a letter dated May 17, 1910, says: "I have never seen the ox-bot so numerous; of our eight head of cows every one is affected with from six to over sixty each. Other cows in the neighborhood are also affected." I visited West Newbury, May 27, and saw the cows referred to but obtained only one larva; most of the larvæ having already left the cattle. The larva was apparently full grown, but light brown in color.

During the early part of June while at Manchester, Vt., I found the cattle slightly affected, about half of the cows having from one to four bots. Three larvæ were obtained June 9, one of which was white, about half grown, I should judge, but the swelling was just as large due to the presence of a large amount of pus; the second specimen was a light brown apparently full grown, but like the one from West Newbury failed to pupate; the third was evidently ready to leave the cow, the opening was large and the larva blackish in color. It was placed in damp earth and pupated June 11, the imago emerging June 30. From these observations I am inclined to doubt the statement that "the full-grown larva when escaping from the back is of a grayish-white color."

In comparing the above-mentioned fly with specimens of *H. lineatum* De Villiers, from Texas and Colorado, I find that the species is *H. bovis*, the occurrence of which in North America has been doubted. Whether all of the larvæ referred to belong to this species I cannot say, as both species probably occur in New England. *H. bovis* can be readily distinguished from *H. lineatum* by yellow pile of the thorax extending to the suture, the broader and less conspicuous polished ridges on the thorax, the wings slightly darker, the entirely black metanotum and black tibiæ. It is also noticeably larger and more robust.

Ceratinostoma ostiorum Haliday.

Scatophaga ostiorum Halid., Curtis Brit. Entom., 405, 1832.
Scatomyza boreale Zett., Ins. Lapp., 721, 4, 1838.
Scatophaga oceana Macq., Ann. Soc. Ent. France, VII, 423, pl. 11, fig. 2, 1838.
Lispa lestremense Bigot, Anna. Soc. Ent. France, IV, (Ser. 6) 292, 1884.
Ceratinostoma maritimum Meade, Ent. Monthly Mag., XXII, 152, 1885.

This European species has not been recorded from North America although it is quite generally distributed along the New England coast. I first received several specimens from Mr. S. A. Shaw, collected at Hampton Beach, N. H., May 24. Mr. Owen Bryant captured a specimen at Cohasset, Mass., September 9, and Dr. C. S. Minot a specimen at Northeast Harbor, Maine, July 4, 1909. On July 25, 1907, the writer obtained a number of specimens at Orr's Island, Maine, on the wet rocks at low tide. A number were also obtained on the rocky shore at Shackford's Head near Eastport, Maine, July 14, 1909.

Mead refers to this genus as occupying an intermediate position between Scatophaga and Cordylura. "It has the elongated horny proboscis with the numerous vibrissæ of the species in the former genus and the sub-cylindrical incurved clubbed male abdomen of those of the latter."

The species can be readily recognized by the following characters: Face white, front dark brown, antennæ and proboscis black, palpi yellow. Thorax, abdomen and legs slate-gray in color, the former having three wide obscure stripes. Tegulæ and halteres yellow. Hairs and bristles noticeably shorter than in most of the *Scatophagi*. Length 8 mm. The synonomy is that given in the Katalog der Paläarktischen Dipteren, IV, 12.

Scatophaga volucricaput Walker.

Cordylura volucricaput Walker, List Dipt. Brit. Mus. pt. 4, p. 977, 1849; Aldrich, Cat. N. A. Dipt., p. 566.
Hydromyza volucricaput Slosson, Ent. News, Vol. VI, p. 320, 1895.

Specimens agreeing with the description of this species (which proves to be a Scatophaga) are represented from the following localities: Mt. Washington, N. H., (Mrs. Slosson); Durham, N. H., July 17, 1905 (J. Randall); Buffalo, N. Y., October 25 (M. C. Van Duzee).

Palloptera similis n. sp.

Head and antennæ yellow, arista brown, ocellar triangle blackish. Thorax and scutellum shining, reddish yellow, pluræ yellow, opaque. Abdomen shining, yellow, the posterior edges of the segments narrowly and the sides broadly margined with black. Legs and halteres light yellow. Wings with the broad anterior of dark brown, as in *P. superba* Loew, but the brown at the posterior cross vein is not connected. Length, 6 mm.

One ♀ collected by the writer at Fort Kent, Maine, August 17, 1910. Type in the New England Collection of the Boston Society of Natural History.

This species closely resembles *P. superba* but is readily separated by its shining thorax and abdomen, with the black margins of the segments continuous and not punctate. From *P. jucunda* it is distinguished by its larger size and by the marginal cell being entirely brown.

Palloptera arcuata Fallen.

Two specimens of this species were collected by Dr. C. S. Minot at Northeast Harbor, Maine, July 1, 1909. It has previously been recorded in America only from the White Mts., N. H. *Sapromyza inusta* Meigen given as a synonym in Aldrich's Catalogue (p. 582) is a good species and a true Sapromyza. Figure 15, page 80 of Williston's Manual North American Diptera, represents *Palloptera superba* and not *P. jucunda* Loew.

ORTALIDAE.

The following species of this family have been collected in various parts of New England, extending considerably their recorded distribution.

Rivellia brevifasciata Johns., Tuckernuck Isl., Mass., July 21, 1910 (Dr. G. M. Allen).

Rivellia conjuncta Loew, New Haven, Conn., June 8 (Dr. W. E. Britton); Barnstable, Mass., July 4; Woods Hole, Mass., July 24 (C. W. Johnson).

Rivellia quadrifasciata Macq., New Haven, Conn., Aug. 1, Springfield, Mass., July 13 (Dr. Dimmock).

Rivellia pallida Loew, Mt. Greylock, Aug. 8, 1907 (Owen Bryant); Auburndale, Aug. 9, and Plymouth, Mass., July 27 (C. W. Johnson).

Tritoxa incurva Loew, East Hartford, Conn., Aug. 9, 1904 (P. L. Butrick).

Tephronota canadensis Johns., Eastport, Maine (C. W. Johnson).

Tetanops luridipennis Loew, New Haven, Conn., June 26 (H. L. Vierick).

Euxesta scoriacea Loew, Bourne, Mass., June 17 (P. G. Bolster).

Chaetopsis apicalis Johns., Common along the salt marshes at Edgartown, Chatham, and Cohasset, Mass.

Seoptera colon Loew, Northeast Harbor, Maine, July 16, 1906 (Dr. C. S. Minot).

Stenomyia tenuis Loew, North Haven, Conn., Nantucket, Barnstable and Woburn, Mass. This is now placed in the genus *Chætopsis* by Hendel (Gen. Ins., Muscaridæ, Ulidinæ, p. 35).

Eumetopia rufipes Macq., New Haven, Conn., July 27, 1904 (P. G. Butrick); Kingston, R. I., June 23, 1905 (Barlow); Now placed in the genus *Eumetopiella* Hendel 1907.

Tanypeza longimana Fallen.

This species, although not recorded from North America, seems to be quite generally distributed: Algonquin, Ill., June 8, 1895 (Dr. W. A. Nason); Niagara Falls, N. Y., June 28, 1901; Norwich, Vt., July 8, 1908.

Saltella scutellaris Fallen.

Piophila scutellaris Fall., Heteromyzides, 10, 3, 1820.
Nemopoda ferruginea Desv., Myodaires, 744, 2, 1830.
Saltella nigripes Desv., Myodaires, 747,2, 1830.
Nemopoda scutellata and *ruficoxa* Macq. Hist. Nat. Dipt., II, 481, 1835.
Saltella pectoralis Zett., Dipt. Scand., IV, 2515, 8, 1847.

A single specimen of this European species was taken by Mr. M. C. Van Duzee at Hamburg, N. Y., June 20, 1909.

Eusiphona mira Coquillett.

Hanover, N. H., July 14–6, 1908. It was found only on the flowers of the cone-flower (*Rudbeckia hirta*).

Odinia maculata Meigen.

Milichia maculata Meig., Syst. Beschr., VI, 132, 1830.
Milochia ornata Zett., Ins. Lapp., 787, 1, 1838.
Odinia trinotata Desv., Myodaires, 648, 1, 1830.

Dauphine County, Pa., April 20, 1897 (Dr. D. M. Castle); Cambridge, Mass., June 11, 1908 (Dr. G. M. Allen).

Odinia picta Loew.

There seems to be no record of the occurrence of this species since it was described from Georgia. A specimen was taken by the writer at Glenside, Pa., June 2, 1895. A second specimen from Branford, Conn., June 23, was collected by Mr. H. L. Viereck.

THE NORTH AMERICAN FORMS OF *LASIUS UMBRATUS* NYLANDER.[1]

By William Morton Wheeler.

Like many other ants that are peculiar to the north temperate zone, *Lasius umbratus* is very widely distributed and presents a number of local subspecies and varieties. In the Old World it ranges from England to Japan, through northern and central Eurasia; in North America from Nova Scotia and the Atlantic States to the Rocky Mountains and will probably be found on the Pacific Coast, at least in the mountains of California or at lower elevations in Washington and Oregon. According to Forel and Emery the species is represented in Europe by four subspecies, namely, the typical *umbratus* Nyl., *mixtus* Nyl., *affinis* Schenk and *bicornis* Förster. To these Ruzsky has added a fifth, *exacutus*, from Oriental Russia. To judge from a female specimen in my collection, the Japanese form is indistinguishable from the typical *umbratus*. Transitional forms which Forel has called *mixto-umbratus* occur in Switzerland, and others which Ruzsky has called *umbrato-affinis* have been taken in eastern Russia. Mayr cited three forms from the United States: *mixtus*, *affinis* and *bicornis*, but Emery has shown that the first of these differs slightly from the European *mixtus* and had been previously described by Walsh as *Formica aphidicola*, and that the last is a distinct subspecies which he has called *minutus*. He was unable to find *affinis* among his American material and I have been equally unsuccessful. This form, therefore, is probably not represented on our continent. More recently

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[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 30.

Viereck has described from New Mexico a new subspecies as *subumbratus*, and another subspecies, *vestitus*, from Idaho, is added in the present paper. This form may prove to be the hitherto unknown female of Emery's *L. speculiventris*, which, I believe, is merely a subspecies of *umbratus*.

All the various forms that constitute the species *umbratus* may be readily distinguished in the worker and female phases from the other species of *Lasius*, by the following peculiarities: the maxillary palpi are 6-jointed and this character places the species in the genus *Lasius sensu stricto* and removes it from the exclusively North American subgenus *Acanthomyops*, which includes species with 3-jointed maxillary palpi and a strong odor like that of lemon verbena or oil of citronella. The joints of the maxillary palpi in *umbratus* are not long and subequal as in *L. niger* and its various forms, but grow successively shorter towards the tip. It differs from our two other *Lasii* with yellow workers and diminishing maxillary joints (*L. flavus nearcticus* Wheeler and *L. brevicornis* Emery) in having the antennal scapes extending a considerable distance beyond the posterior corners of the head, the larger size of the eyes in the worker, and in being more or less tinged with brown in this phase. Moreover, the female *umbratus* has the head as broad as the thorax, whereas in *nearcticus* and *brevicornis* it is distinctly narrower. It is by no means easy to separate the various subspecies or races of *umbratus* on morphological characters, such as the size of the eyes of the worker, shape of the petiole of the worker and female, dentition of the mandibles of the male, etc., since these characters are rather inconstant. More satisfactory distinctions are furnished by peculiarities of stature, pubescence, pilosity and color.

Notwithstanding its wide distribution *L. umbratus* is by no means as common as other species of the genus. In North America however, it is much more frequently met with than in Eurasia; but even in our country it is sporadic, being abundant in certain localities and totally lacking in others. It prefers rather damp, shady spots like those occupied by *L. nearcticus* and the species of *Acanthomyops*. Like the species of this sub-genus it forms populous colonies under stones, in rotten stumps or logs or constructs large masonry dome nests. These dome nests I have seen only in meadows or in clearings in the woods where the soil is covered with grass and is more or less exposed to the sun. The subspecies *subumbratus* is an exclusively boreal form, occurring only in British America and at elevations above 7,500 ft. in the Rocky Mountains. The same is probably true of *vestitus*. The subspecies *minutus* and *speculiventris* and the variety *aphidicola* occur in the transition zone and of these only *aphidicola* is at all common. Like our other yellow *Lasii*, *umbratus* is subterranean in its habits and devotes itself to the care of root-aphids and -coccids, all or nearly all of its food consisting of the sweet excreta of these insects.

The sexual phases are rarely found in the nests of *umbratus*, apparently because they are not retained by the parental colonies for days or weeks during the latter part of the summer or early fall but escape for their marriage flight very soon after reaching maturity. Recent studies in Europe indicate that the just-fertilized *umbratus* queen is unable to establish her colony independently after the manner of *L. niger* and *flavus*, but becomes a temporary parasite on a colony of *niger* or of one of its subspecies or varieties after the manner of certain species of *Formica* of the *rufa* and *exsecta* groups. Our American *umbratus* forms apparently behave in the same manner. De Lannoy and Wasmann, moreover, have collected some evidence to show that *umbratus* is in turn the temporary host of the palearctic *L. fuliginosus*. The rare or sporadic occurrence of *umbratus* on both continents certainly points to parasitic habits on the part of the queen and her incipient colony.

The following tables will facilitate the identification of workers and females of our North American forms of *umbratus:*

WORKERS.

1. Antennal scapes and tibiæ with very few or no erect hairs; gaster with appressed pubescence..2
   Antennal scapes and tibiæ with abundant erect hairs; gaster without pubescence........................subsp. **speculiventris** Emery.
2. Gaster with sparse pubescence and short erect hairs, shining; average length of body over 4 mm..3
   Gaster very densely pubescent, with long erect hairs, subopaque; average length of body less than 4 mm...........subsp. **minutus** Emery.
3. Pale yellow; eyes small.....................subsp. **subumbratus** Viereck.
   Brownish yellow; eyes larger....subsp. **mixtus** Nyl. var. *aphidicola* Walsh.

FEMALES.

1. Length not exceeding 4.5 mm....................subsp. **minutus** Emery.
   Length not less than 6 mm 2
2. Scapes and legs covered with dense, erect hairs; length 6 mm..................................subsp. **vestitus** subsp. nov.
   Scapes and legs naked or with only a few scattered erect hairs; average length more than 6 mm..................................3
3. Body dark brown above; erect hairs on the gaster very short or absent....................subsp. *mixtus* Nyl. var. **aphidicola** Walsh.
   Body light brown or reddish; hairs on gaster very long, reclinate..................................subsp. **subumbratus** Viereck.

1. Lasius umbratus subumbratus Viereck.

Trans. Ent. Soc. Phila. XXIX, 1902, p. 72. ♀.

Worker. Length 4–5.5 mm.

Very similar to the typical *umbratus*. Body shining and rather smooth, especially the clypeus and gaster. Pubescence and pilosity abundant, the former more so on the head and thorax than on the gaster. Erect hairs on the femora few and scattered, absent on the tibiæ and scapes. Eyes small. Petiole high and much compressed anteroposteriorly, its sides and upper border rounded, the latter entire or with a very feeble notch. Pale yellow throughout, except the mandibles, which are reddish brown, with black teeth, and the articulations of the antennal funiculi which are fuscous or blackish.

Female. Length 7–8.5 mm.

Differing from the true *umbratus* as follows: Color paler, being a light brown or reddish, with the lower surface and the legs more yellowish. Pubescence much longer and more abundant. Hairs on the head, thorax and abdomen very long, slender and reclinate; absent on the legs and scapes. In some specimens the hairs on the head are short and sparse. Border of the petiole bearing a fringe of long hairs, its upper border much less deeply notched than in the true *umbratus*. Wings gray, with basal halves distinctly infuscated as in the other forms of the species.

Male. Length 3.5–4.5 mm.

Differing from the true *umbratus* only in its somewhat paler color and in lacking erect hairs on the legs and scapes. Eyes hairy as in that form and with the mandibles furnished with two larger apical and several minute basal teeth.

This subspecies was originally and rather inadequately described by Viereck from two females taken at Beulah, N. M. (about 8,000 ft.), one August 17 by Dr. H. Skinner, and one July 27 by Prof. T. D. A. Cockerell. These are in the type collection of the Phila. Acad. Nat. Sci. In my own collection the form is represented from the following localities:

New Mexico: Beulah (Cockerell; topotype), one deälated female.

Colorado: Two females, one deälated, taken by P. J. Schmitt; one deälated female taken by myself in Cheyenne Cañon (about 8,000 ft.), near Colorado Springs; numerous workers from Williams Cañon, near Manitou (about 7,500 ft.), also captured by myself.

Utah: Numerous workers from Little Willow Cañon (C. V. Chamberlin).

Nova Scotia: Many workers, males and winged females taken from five colonies by Mr. John Russell at Digby, and six deälated females taken at Bedford, near Halifax by Mr. William Reiff.

Dr. P. P. Calvert and Mr. E. T. Cresson, Jr., kindly compared one of the female specimens from Nova Scotia with Viereck's type and state that the former differs from the latter only in being somewhat more yellowish and less reddish. I am unable to detect any differences even in coloration between my Rocky Mountain specimens and those from Nova Scotia.

It is interesting to note, as bearing on the probable temporary parasitism of *umbratus*, that the six deälated queens taken by Mr. Reiff at Bedford, N. S., were found living in three colonies of the large yellowish form of Lasius *niger* var. *neoniger* Emery so characteristic of boreal America.

2. **Lasius umbratus mixtus** Nyl. var. **aphidicola** Walsh.

Formica aphidicola Walsh, Proc. Ent. Soc. Phila. 1862, p. 310, worker ♂.
Lasius aphidicola Mayr, Verh. zool.-bot. Ges. Wien, XXXVI, 1886, p. 429; Dalla Torre, Catalog. Hymen. VII, 1893 p. 182.
Lasius umbratus subsp. *mixtus* var. *aphidicola* Emery, Zool. Jahrb. Abth. f. Syst. VII, 1893, p. 640, 641, worker ♀ ♂; Wheeler, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 397; Occas. Papers Bost. Soc. Nat. Hist. VII, 7, 1906, p.13.
Lasius speculiventris Wheeler, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 397.

Worker. Length 3.5–4.5 mm.

Brownish yellow, with the appendages, lower portion of the body and anterior portion of the head paler. Surface, especially the dorsum of the gaster shining, owing to the short and dilute, though distinct pubescence. Hairs erect, coarse and rather abundant, short on the gaster, absent on the scapes and legs. Petiole seen from behind with rounded or subangular sides and the notch in the upper border variable, but usually feeble.

Female. Length 6–7 mm.

Dark brown; mandibles, appendages, pleuræ, epinotum and petiole usually reddish or yellowish. Basal half of wings strongly infuscated. Pilosity and pubescence similar to those of the worker but the pubescence on the gaster denser so that this region is much less shining than in the worker. Erect hairs on the gaster often absent, when developed scattered and very short except on the terminal segments. Eyes very hairy. Petiole from behind with rounded sides and upper border, the latter feebly emarginate.

Male. Length 4–4.5 mm.

Mandibles with two apical and no basal teeth. Body black; appendages piceous; wings colored like those of the female. Surface, especially that of the gaster, smooth and shining. Pilosity moderately developed, erect; absent on the scapes and legs; pubescence more dilute and inconspicuous than in the worker. Eyes hairy.

I have followed Emery in regarding this subspecies as the one which Walsh described as *Formica aphidicola*, though his description is very inadequate. As it is our most common form of *umbratus*, it is, in all probability, the one which he saw. The types came from Rock Island, Ill. I have examined numerous specimens from the following localities:

Illinois: Rockford (Wheeler); Algonquin (W. A. Nason).

Wisconsin: Milwaukee (C. E. Brown).

Michigan: Ann Arbor (J. Dawson).

Maine: Elms (W. Deane).

New Hampshire: Mt. Washington (Mrs. A. T. Slosson).

Massachusetts: Boston (Wheeler); Essex County (G. B. King); Medford (Mus. Comp. Zool.).

Connecticut: Colebrook (Wheeler); Westport (W. E. Britton).

New York: Bronxville (Wheeler); Bergen Beach (G. v. Krockow); Staten Island (W. T. Davis).

New Jersey: Ithaca (J. C. Bradley); Fort Lee, Great Notch and Ramapo Mts. (Wheeler); Tom's River (W. T. Davis); Woodbury (H. Viereck).

Pennsylvania: St. Vincent (P. J. Schmitt), Philadelphia; Tinicum Islands; Enola.

North Carolina: Black Mts. (Wm. Beutenmuller); Raleigh (F. Sherman).

Colorado: Florissant and Colorado Springs (Wheeler); Eldora, 8,600 ft. (Mrs. W. P. Cockerell).

Emery cites *aphidicola* also from Caldwell, N. J., District of Columbia and Virginia. According to this authority, *aphidicola* is so close to the European *mixtus* as to be scarcely distinguishable. The color of the worker of the American form is usually darker, and the body and wing color of the female is decidedly deeper. Worker forms are sometimes found with a few, scattered erect hairs on the antennal scapes and tibiæ and therefore represent transitions to the typical *umbratus*.

3. **Lasius umbratus minutus** Emery.

Lasius umbratus var. *bicornis* Mayr, Verh. zool.-bot. Ges. Wien, XXXVI, 1886, p. 430.

Lasius umbratus subsp. *minutus* Emery, Zool. Jahrb. Abth. f. Syst. VII, 1893, p. 641, worker ♀ ♂; Wheeler, Bull. Amer. Mus. Nat. Hist. XXI, 1905, p. 397; Occas. Papers Bost. Soc. Nat. Hist. VII, 7, 1906, p. 13.

Worker. Length 3–3.5 mm.

Brown, with the cheeks, clypeus, mandibles, appendages and lower surface of the body more yellowish. Body so densely pubescent that its shining surface is obscured and appears glossy or subopaque. Hairs on the head, thorax and gaster abundant, erect and coarse, on the gaster longer and more conspicuous than in the two preceding subspecies. Scapes and legs naked; lower surfaces of the femora with a few scattered, erect hairs. Petiole high and narrow, with straight sides and a distinct notch in the apical border.

Female. Length 4–4.5 mm.

Dark brown; mandibles, mouthparts and appendages, except the middle portions of the femora, pale brown; wings gray with infuscated bases. Pubescence and pilosity very similar to those of the worker, but longer. Petiole more feebly notched.

Male. Length 2.6–3.5 mm.

Black; with piceous legs and antennæ. Wings colored like those of the female. Mandibles with two apical and no basal teeth. Pubescence and pilosity like those of the worker, but the former more dilute, so that the surface of the body is more shining. Discoidal cell of the wing often incomplete or lacking.

The type specimens described by Emery came from New Jersey and Maine. I have examined specimens from the following states:

New Jersey: Cotypes (T. Pergande).
Maryland: Chestertown (E. G. Vanatta).
Illinois: Rockford (Wheeler).

Michigan: Ann Arbor (J. Dawson).
Connecticut: Colebrook (Wheeler).
Massachusetts: Forest Hills, Boston (M. Tanquary); Medford (Dall.).

Emery has called attention to the resemblance of this species, which is characterized by the small size of the females and the peculiar pubescence and pilosity of these and the workers, to the European *bicornis* and *affinis*. The description given above is drawn from numerous specimens of all three phases taken August 12, 1910, taken by Mr. M. Tanquary from a large masonry dome nest in low ground near Forest Hills, Mass. The deälated females bear a remarkable resemblance in size and coloration to the corresponding phase of our common *Tapinoma sessile*.

4. **Lasius umbratus vestitus** subsp. nov.

Female. Length about 6 mm.

Differing from *subumbratus* and *aphidicola* in its smaller size and in pilosity. Body dark brown above, with paler lower surface, mandibles, antennæ and legs. Surface finely shagreened and shining but appearing more opaque on account of the dense layer of fine grayish pubescence. Hairs sordid white, fine and uniformly abundant, erect, long on the body, shorter on the scapes and legs. The petiole, which is fringed with long hairs, has a peculiar shape, being in profile cuneate and inclined forward and rather thick at the base; seen from behind it is narrowed above, with a blunter and more rounded margin than in the other subspecies, and without emargination. Wings very long (8 mm.), faintly infuscated at the base.

Described from a single specimen taken by Prof. J. M. Aldrich at Moscow, Idaho.

This may be the female of *L. speculiventris*, of which Emery described only the male and worker.

5. **Lasius umbratus speculiventris** Emery.

L. speculiventris Emery, Zool. Jahrb. Abth. f. Syst. VII, 1893, worker ♂.

" *Worker.* Yellow; head subpubescent, densely hairy; scapes and tibiæ hirsute with erect hairs; head, thorax and legs pubescent, gaster without appressed pubescence, delicately, microscopically, transversely rugulose, very shining. Length 3.5–4 mm.

Male. Fuscous; legs, antennæ and genitalia pale; densely pilose; scapes with short hairs; tibiæ with scattered, scapes with short hairs; wings clouded with fuscous at the base. Length 3.5–4 mm., width of head 1.2 mm., length of scape 0.7 mm., anterior wing 4.5 mm.

Caldwell, N. J., from Mr. Pergande.

The worker is distinguished by the abundant, erect pilosity of the antennal scapes and tibiæ and by the complete absence of appressed pubescence on the gaster. The latter region, owing to the lack of the fine punctures connected with the pubescence, is remarkably shining. With the aid of a very strong lens its surface is seen to present, in addition to the hair-bearing punctures, only a very fine rugosity, in the form of long, transverse meshes. Whether this form is to be retained as an independent species or is to be regarded as a subspecies of *umbratus*, cannot be decided at present.

In the male the antennal scape is densely covered with short, oblique hairs as on the male of the European *umbratus;* it is relatively short and when placed transversely reaches beyond the eye about two fifths of the length (in *umbratus* the transversely placed scape extends easily half its length beyond the eye). The tibiæ bear only a few erect hairs. The general pilosity is more abundant and like that of the males of the true *umbratus* which I have before me." (Emery.)

I have translated the original description because I have not seen specimens of *speculiventris*. In my "Annotated List of the Ants of New Jersey" I stated that I had taken this form at Fort Lee and Great Notch, but examination of these specimens shows that they are merely very shining examples of *aphidicola*. As the characters mentioned in Emery's description are scarcely of specific value, I believe that I am justified in placing *speculiventris* among the *umbratus* forms. As already stated the subspecies described above as *vestitus* may be merely the hitherto unknown female of Emery's form.

SOME BEES FROM ELDORA, COLORADO.

By T. D. A. Cockerell.

The University of Colorado, Boulder, Colo.

My wife and I spent the afternoon of August 18 and morning of August 19, 1910, at Eldora, in the mountains of Boulder County, Colorado. The locality is in the Canadian Zone, at an altitude of about 8,550 ft., and has a bee-fauna rather widely different from that of Boulder. So many interesting species were collected that it seems worth while to put the whole on record. At this season of the year, the best bee-plant at Eldora is *Grindelia subalpina* Greene, a very fine species which makes the valleys gay with its orange-yellow flowers. Less abundant, and much less conspicuous is *Phacelia leucophylla* Torrey, with white flowers. These two are referred to by their generic names alone in the following list:

Andrena n. sp. Much like *A. hirticincta*, but hair at end of female abdomen pale. Females rather common at *Grindelia;* one male on *Erigeron*. This species was named in MS. by Viereck, from specimens collected in New Mexico; it will be published in his revision.

Halictus lerouxii Lep. Both sexes common at *Grindelia*.

Halictus ruidosensis Ckll. Both sexes at *Phacelia*, the males abundant.

Agapostemon texanus subtilior Ckll. One male at *Grindelia*. This sex is undescribed; it differs from true *texanus* by its smaller size, the metathorax more delicately sculptured, black on legs reduced, and flagellum paler.

Specodes (*Sphecodium*) **fragariæ** Ckll., var. a. Female smaller, about 5 mm. long, face more narrowed below, middle of abdomen much suffused with black. One at *Phacelia*. This may be a distinct species, but I have only a single specimen, and *fragariæ*, as represented by numerous specimens collected at Florissant, is very variable.

Perdita snowii Ckll. Common at *Grindelia*. This species was described from a single specimen collected by Snow in 1892 in Estes Park, Colorado. Later, I took a specimen at Santa Fé, New Mexico, but the species has escaped rediscovery in Colorado until the present time. The male, which was not known, runs in my table in Proc. Phila. Acad. Sci., 1896, to 28, except that there is a small black mark or band along each side of the upper part of the clypeus, not on the clypeus itself. It runs on to 30, but face is bare, while mesothorax is hairy. The following characters are distinctive: Face below antennæ bright chrome yellow; yellow in median line extending above antennæ as a small spear-head shaped mark; at sides extending upwards broadly, then abruptly ending, except for a line along the eye, the whole like a closed hand with index finger pointed; a narrow yellow stripe along lower half of posterior orbits; scape yellow; flagellum yellow beneath; anterior knees yellow and their tibiæ broadly yellow in front; tubercles and two marks on upper border of prothorax yellow; middle legs with much yellow, but hind legs with only knees yellow; abdominal bands yellow, broad, entire, except the first, which is narrowly interrupted. A marked character of the species is the dull hairy mesothorax.

Panurginus didirupa Ckll. Both sexes taken; the females at *Grindelia.*

Panurginus bakeri Ckll. Both sexes at *Phacelia.* The female is new; it is about 5½ mm. long, with the legs black, including tarsi; face all black, shining; wings smoky; nervures and stigma dark. It resembles the female of *P. pauper*, but is easily separated by the dark tegulæ and more distinctly punctured mesothorax.

Nomada accepta Cress. One female at *Grindelia.*

Triepeolus subalpinus n. sp. One at *Grindelia.*

♀. Length about 11½ mm.; a species with "false pygidium" relatively small, related to *T. micropygius* Rob., but anterior legs black, with tarsi reddish; middle femora black above, red beneath; hind femora and middle and hind tibiæ and tarsi red; spurs black; upper part of pleura covered with dull pale yellowish hair, thin in middle posteriorly, lower half bare, coarsely and closely punctured, but some of the shining surface visible on the lower part; labrum black, densely punctured; mandibles black, faintly reddish toward apex; clypeus closely, very minutely punctured, with scattered large punctures; antennæ black, third joint reddish apically; mesothorax very densely punctured, with a light hair-margin at sides and behind, and a pair of short and broad, not dense, anterior longitudinal bands; teeth at sides of scutellum hardly produced; tubercles black; tegulæ reddish-brown, closely punctured; second submarginal cell narrowed almost to a point above; black area of first abdominal segment a broad transverse band, truncate laterally; apical and basal light bands of first segment narrowly interrupted, the others entire, fifth with a large, light patch on each side; band on second segment with anterior lateral extensions broadly triangular, the angle formed very obtuse. Superficially like *T. pectoralis* Rob., but easily separated by the reduced axillar teeth, form of band on second abdominal segment, much denser punctures on lower part of pleura, etc.

Epeolus eldoradensis n. sp. Two at *Grindelia.*

♂. Length about 8 to 9 mm.; very close to *E. argyreus* Ckll., but wings brownish, middle and hind legs more or less red, and third antennal joint without red. The metathoracic area is larger than in *argyreus*, the cheeks are broader, and the femora are not so hairy.

Eyes sage green; hair of face pure shining white; clypeus densely minutely punctured, without large punctures; antennæ black; mesothorax with rather thin pale creamy hair, rather evenly distributed, so that there are no definite markings; axillar teeth very short and blunt; tubercles black; tegulæ dark reddish-brown;

second s. m. narrow, narrowed about one-half above; pleura very densely covered with shining white hair; middle and hind spurs black; anterior legs black; middle red, the femora black above; hind legs red; abdominal segments 1 to 6 covered with pale ochreous-tinted hair, no definite light patch on first, but a small discal area where the hair is thinner, and there are a few reddish scales; second segment with a broad basal band of reddish hair, not reaching the sides, third with a narrower band of the same kind.

Var. a. Smaller; Midde femora black, as also outer side of their tibiæ; hind femora black except at apex, and their tibiæ suffused with blackish on outer side; first abdominal segment with a transverse, rather poorly defined black (bare) band; second with the basal half black except at sides. This looks distinct, but is probably only a variety, as *Argyroselenis minima* Rob. varies in much the same manner as to the abdomen. It is the var. a. which most resembles *E. argyreus*.

Clisodon terminalis Cress. One female at *Chamœnerion angustifolium*.

Melissodes hymenoxidis Ckll. Females at *Grindelia*, also nesting in ground. Two were observed to enter the same nest.

M. confusa Cress. Both sexes at *Grindelia*.

M. confusiformis Ckll. One female at *Grindelia*.

M. menuacha Cress. One male at *Grindelia*. This is the same as the New Mexico insect I have identified as *menuacha*, but differs from a Colorado example (not the type) from the Cresson collection. I believe it is the real *menuacha*, and that Cresson confused two or more species in his collection.

Coelioxys porterae Ckll. One female on sand.

Megachile wootoni calogaster Ckll. One female at *Campanula petiolata*.

Megachile pugnata Say. Females at *Grindelia*.

Megachile perihirta Ckll. One male at *Grindelia*.

Megachile relativa Cress. Females at *Grindelia*.

Alcidamea simplex Cress. Females at *Phacelia*.

Osmia copelandica Ckll. Female at *Phacelia*. The second known specimen.

Osmia pentstemonis Ckll. One female at *Grindelia*.

Osmia wardiana Ckll. One female at *Grindelia*. This is narrower than usual, but apparently not a distinct species.

Osmia fulgida Cress. Two females at *Phacelia*. These are green, and agree with the form named *viridis* by Cresson, except that the hair of the thorax above, instead of being black, is reddish with a few black hairs intermixed.

Osmia densa Cress. Two females, one at *Grindelia*. A variable species.

Osmia grindeliæ n. sp. One at *Grindelia*. Var. a. at *Phacelia*.

♀. Length about 9 mm.; the abdomen subglobose; head about as wide as thorax, dark greenish and purplish, densely punctured; clypeus mainly dark purplish; cheeks olive green; face, front and vertex with long coarse black hair, occiput with some white hair; mandibles tridentate; flagellum faintly reddish beneath except at base; mesothorax black on disc, green at sides; scutellum and postscutellum olive-green, but metathorax dark bluish; hair of thorax above white, with long black hairs sparsely intermixed; of pleura black, comparatively short, of sides of metathorax white; tegulæ piceous; wings stained with brown; legs black, not metallic; abdomen dark green, the hind margins of the segments bluer; first segment with white hair, the others with it thin, short and black, a little glittering white principally along hind margins of segments and on apical segment; scopa black.

In my table in Univ. of Colo. Studies, 1907, p. 250, this runs to *O. wilmattæ*, from which it differs by its darker, green, coloration, and the smaller subglobose abdomen. The hair on the pleura is only about half as long as in *O. pikei.*

Var. a. Similar, but hair of pleura somewhat pallid. This is much darker than *O. phaceliæ*, and the tegulæ are not conspicuously green in front as in that species.

Anthidium tenuifloræ Ckll. Both sexes at *Grindelia.*

Dianthidium pudicum Cress. Both sexes at *Grindelia.*

Apis mellifera ligustica Spin. Only one seen; at *Grindelia.*

Bombus flavifrons Cress. At *Grindelia.*

Bombus juxtus Cress. At *Phacelia.*

Bombus rufocinctus astragali Ckll. One male at *Grindelia.*

For other records of Bombidæ from Eldora, see Univ. of Colo. Studies, IV, pp. 257–258, and VII, p. 186.

SOME BEES FROM ECUADOR.

I am indebted to Mrs. L. H. Dyke for some bees which she recently collected at Portobelo (pronounced Porto Bello), Ecuador, at an altitude of about 4,000 ft.

(1) **Euglossa cordata** (L.)

(2) **Xylocopa varians ecuadorica** Ckll. This was described only last year, from material in the British Museum.

(3) **Mesocheira bicolor elizabethae** subsp. nov.

♀. Length 12 mm., in most respects similar to *M. bicolor.* Face, cheeks, and occiput with dull white (not reddish) hair, vertex with black; antennæ black, the first three joints and extreme base of fourth broadly red beneath; thorax above dark green, the scanty hair dull white and black; abdomen a fine greenish blue, almost steel-color, but greener, the basal part of the first segment dark red. Extraordinarily like *Melissa decorata* Smith, but the scutellum quite different. Named after Mrs. Dyke's little daughter Elizabeth.

These bees illustrate the fact, already indicated by other collections, that the Brazilian bee-fauna passes over into the mountains of Ecuador, the species becoming in most cases distinctly modified.

T. D. A. COCKERELL.

A FEW NEW PSAMMOCHARIDÆ.

By Nathan Banks.

East Falls Church, Va.

Psammochares transversalis n. sp.

♀. Black; face silvery each side of the antennæ, wings black. Clypeus truncate, margined; antennæ long, slender, third joint very long, as long as width of the face at antennæ; a very distinct line from antennæ to anterior ocellus, latter a little more than its diameter from the smaller laterals, these as close to the eyes as to each other; vertex, from in front, barely rounded; face rather narrow, narrowed above; eyes large. Pronotum depressed behind, and almost angulate; metanotum moderately long, with a median line on the basal part, and the apical part plainly transversely wrinkled; abdomen broad at base, dull, last segment rather brownish, fringed; legs slender, tarsi I with long cilia, more than twice as long as the width of a joint, hind legs not very heavily spinose, hind tibia with the longer spur nearly one-half as long as the metatarsus, last joint of hind tarsus with spines beneath, claws toothed. Wings of moderate length; marginal cell long, acute, second submarginal cell about twice as long as broad, first recurrent vein near the tip; third submarginal shorter, nearly one half narrowed above, second recurrent vein arising much beyond the middle of the outer cell, and running nearly straight to the middle of the third submarginal; basal veins interstitial in the fore-wings, widely dislocate in the hind-wings.

Length 13 mm.

From Palmerlee, Arizona (Biederman). Readily known by wrinkled metanotum.

Psammochares castella n. sp.

♂. Small, narrow, black, not silvery, except on the lower part of the face, second abdominal segment mostly dull red above. Head and thorax very sparsely hairy; clypeus truncate in front, not margined; face broad, especially above; antennæ heavy; a faint line from antennæ to anterior ocellus, latter scarcely more than its diameter from the laterals, and these as close to eyes as to each other; vertex from in front very distinctly rounded; pronotum angulate behind; metanotum short, suddenly depressed behind; abdomen broad at base, dull, apical segment with a marginal fringe; legs slender, only slightly spinose, hind tibia with only three spines above, more on sides, longer spur of hind tibia more than one-half as long as the metatarsus, last tarsal joint without spines below. Wings long and narrow, black, not darker at tips; marginal cells large, submarginals small, second larger than third, latter triangular; first recurrent near tip of second submarginal, second recurrent arises a trifle beyond middle of outer cell and runs into third submarginal joint just beyond middle.

Length 6 mm.

From Fedor, Lee County, Texas, May.

Psammochares tenuicornis n. sp.

♂. Black, very sparsely hairy. Clypeus truncate; antennæ very slender, the third joint plainly longer than the fourth; a distinct line from antennæ to anterior ocellus, latter fully its diameter from the equal laterals, and these nearer to each other than to the eyes; vertex slightly rounded; face rather broad; pronotum strongly arcuate behind, almost argulate; metanotum with distinct median line, not hairy; abdomen rather narrow at base, no tufts of hair below near tip; legs slender, tibiæ with many short, small spines, longer spur of hind tibia barely one-half the length of the metatarsus; spines under last joint of hind tarsus; claws toothed. Wings slender, marginal cell long, nearly rounded at tip; second submarginal cell one and a half times longer than broad, receiving the first recurrent beyond middle, third submarginal about as long as second, but little narrowed above, second recurrent arising beyond middle of outer cell and curving outward to the third submarginal; basal veins dislocated in fore wings, interstitial in hind wings.

Length 11 mm.

From Southern Pines, North Carolina, May.

The forms allied to *Ps. philadelphicus* and *Ps. æthiops* may be tabulated as follows:

Pronotum angulate behind
  Clypeus emarginate; hind wings with the basal veins disjointed **philadelphicus.**
  Clypeus truncate; basal veins interstitial in hind wings.........**illinoiensis.**
Pronotum arcuate behind
  Clypeus deeply emarginate, head very hairy....................**aethiops.**
  Clypeus barely emarginate, less hairy ....**ilione.**

Psammochares ilione n. sp.

Black; hairy, but vertex not as hairy as in *Ps. æthiops;* clypeus barely emarginate in front, third joint of antennæ not near as long as the vertex width; the line from antennæ to the anterior ocellus obliterated in the middle; the anterior ocellus its diameter from the smaller laterals, these as close to each other as to eyes; vertex faintly rounded; face rather broad (broader than in *Ps. philadelphicus*); pronotum hairy, arcuate; metanotum short, the line indistinct; abdomen broad at base, rather dull black, apical segment with long black hairs; anterior tarsi with long cilia; hind tibiæ with the longer spur one-half of the metatarsus, spines below on last joint of hind tarsi. Wings rather long, marginal cell long, acute, second submarginal trapezoidal, first recurrent vein near tip; third submarginal almost triangular, second recurrent arises a little beyond middle of outer cell and curves slightly outward to the middle of third submarginal; basal veins nearly interstitial in the hind wings.

Length 13–15 mm.

From Falls Church, Va.; Southern Pines, N. C.; and Sea Cliff, N. Y. This may be what has been called *æthiops* in the East, but very distinct from the *æthiops* of Colorado, which, however, I have also from Ithaca, N. Y.

Psammochares (*Allocyphonyx*) **harpalyce** n. sp.

Color and general appearance as in *Ps. maura;* but the male is distinct therefrom by prominent silvery hairs on the posterior slope of the metanotum, and the extreme tip of abdomen is pale; the antennæ are the same, and venation similar to *Ps. maura,* but the basal veins dislocated in the hind-wings (interstitial in *Ps. maura*); last joint of hind tarsi without spines beneath.

Length 12–15 mm.

Southern Pines, North Carolina.

Psammochares (*Allocyphonyx*) **hesione** n. sp.

♂. Black; clypeus truncate in front; antennæ short not very heavy; head rather broad, hairy; anterior ocellus its diameter from the smaller laterals, latter as near to eyes as to each other; vertex, from in front, barely rounded; pronotum arcuate behind; metanotum short, hairy, suddenly bent down behind; abdomen broad at base, depressed; legs heavily spinose, several spines on hind femora, even half way to the base, longer spur of hind tibia nearly three-fourths as long as metatarsus; no spines under last joint of hind tarsi; claws cleft. Wings much as in *Ps. maura;* the second submarginal cell very short, third nearly triangular, the second recurrent arising beyond the middle of the outer cell and running somewhat sinuously to the middle of the third submarginal cell; basal veins interstitial.

Length 15 mm.

From Douglas and Hamilton Counties, Kansas (Snow). Related to *Ps. maura,* but the legs are more heavily spinose, and the antennæ do not have such a strongly serrate appearance.

Cryptocheilus idoneus n. sp.

♀. Deep black, wings uniformly deep black or a little paler (not darker) at tips; clypeus margined, slightly, evenly emarginate, antennæ slender, but not near as long as head and thorax, third joint one and a half the length of first joint, scarcely one-half so thick; vertex slightly rounded; anterior ocellus fully its diameter from the nearly equal laterals, these very much nearer to each other than to the eyes; pronotum slightly angulate behind; metanotum with a distinct median groove, not transversely striate; abdomen dull black, hairy near tip, not much depressed; legs slender, spiny, the hind tibia more slender than in *C. fortis* and with short but stout spines above, longer spur about two-fifths of the metatarsus, last tarsal joint with distinct spines beneath (not in *C. fortis*). Wings not very long, marginal cell rounded at tip (like *C. terminatus*); second submarginal plainly longer than broad, receiving the first recurrent at middle; third submarginal barely longer than broad, narrowed above; second recurrent arising much beyond middle of anal cell, curving outward to the middle of the third submarginal cell; basal veins dislocated in fore wings, nearly interstitial in the hind wings.

Length 12 mm.

From Southern Pines, N. C., July 14.

Pseudagenia antennalis n. sp.

♀. Iridescent blue, much like *Ps. cærulescens*, but differs from that species by the antennæ (except black basal joints) being yellowish-brown, and the anterior legs, except dorsal part of femora at base, are pale; the middle and hind tarsi are brown, and the tegulæ are also brown. In structure also similar to *Ps. cærulescens*, but the third joint of the antennæ is shorter than in that species, being only a little longer than the fourth joint; and the second discoidal cell of fore-wings is proportionately shorter and broader than in *Ps. cærulescens*. Of the same size.

From Fedor, Lee County, Texas, May 29, Birkmann Coll., through Prof. C. F. Baker.

Pseudagenia virginica n. sp.

♂. Black, with slight silvery pubescence, coxæ silvery, the spurs white, no white at tip of abdomen. Clypeus truncate, antennæ not very heavy, no line from antennæ to ocelli; anterior ocellus fully twice its diameter from the laterals, the latter a little closer to each other than to the eyes, vertex from in front slightly rounded, face rather long and narrow; hind margin of pronotum impressed, arcuate; metanotum short, rounded, transversely impressed near tip; abdomen slender, hardly petiolate, apical lower margin of first segment produced below; legs slender, longer spur of hind tibia nearly one-half as long as the metatarsus. Wings nearly uniformly smoky; the marginal cell rather long, acute; second submarginal one-half narrowed above, receiving the first recurrent vein before middle; third submarginal larger, one-half narrowed above, the second recurrent arises from beyond middle of apical cell, and runs obliquely to beyond middle of third submarginal cell.

Length 6 mm.

From Falls Church, Va., July 4, 1910.

ARGYNNIS CYBELE FABR. FORMA *BARTSCHI* F. NOV.

By William Reiff.[1]

Last spring while I was examining the collection of Lepidoptera belonging to Mr. Rudolf C. B. Bartsch of West Roxbury, Mass., we were talking on the always interesting theme of the variability of butterflies. Mr. Bartsch told me on this occasion that he possessed a very peculiar but much damaged Argynnis, which he had captured in West Roxbury, Mass., during the first week of July, 1907, together with two other specimens of the same kind. This specimen being in the best condition of all, he had kept but did not save the two other individuals as they were practically ruined. This specimen had the wings partially spread and on account of its injured condition Mr. Bartsch had placed it in a box by itself and laid it aside. He gladly fulfilled my very natural desire to see the interesting butterfly, and upon opening the box I was surprised to see a splendid *Argynnis*, which unfortunately had the wings seriously damaged and the body badly eaten by Dermestes. It was an *Argynnis* form which I had never seen before, neither in nature nor produced by artificial means. The specimen, a male, belongs without doubt to the *cybele* type. Against this identification the only argument would be the narrow, nearly faded light yellow band upon the under side of the hind wings, which is very broad in *cybele*. If we lay stress on this character, we might be led to suppose that we had a form before us belonging to the type *alcestis* Edwards. But this is impossible, since *alcestis* is an exclusively western subspecies. The eastern form *aphrodite* Fabr., which runs parallel with *alcestis* cannot be considered in this connection, since in *aphrodite* not only is the base of the underside of the fore wings always very red but the other colors have little conformity with those of *cybele*. There have not been seen, according to my knowledge, any specimens of *aphrodite* in West Roxbury and vicinity. Moreover, the place in which the aberration was taken is an isolated swampy meadow, almost entirely surrounded by woods, and a flight to this place from localities far away is highly improbable.

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[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 33.

The two photographs reproduced on the accompanying plate show very well the upper and under side of the specimen. It will be noticed that the fore wings do not have the breadth of normal *Argynnis* forms, while the hind wings show a more oval rounding than usual. All rows of spots and points beyond the base are confluent into more or less distinct bands and this is true both of the upper and under side of all the wings. It is this which gives the specimen its extraordinary appearance. The bands nearest the border are more distinct and complete than the inner bands, but except for the yellow on the upper side, which is somewhat lighter than usual, the colors are almost normal.

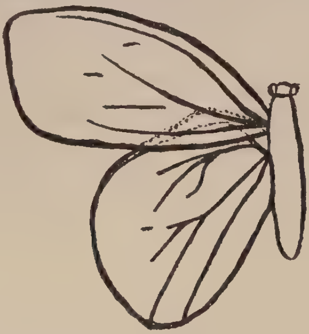
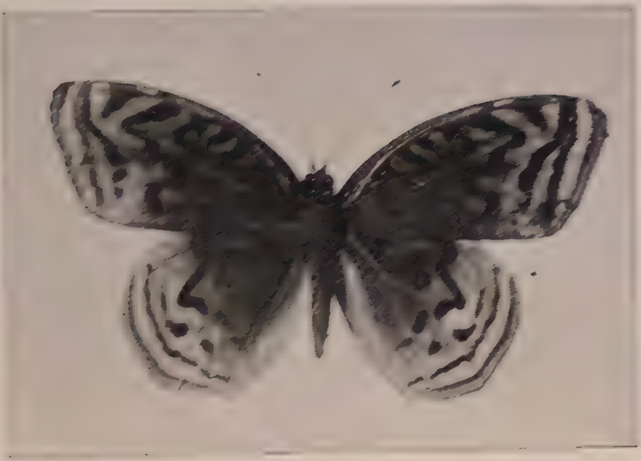


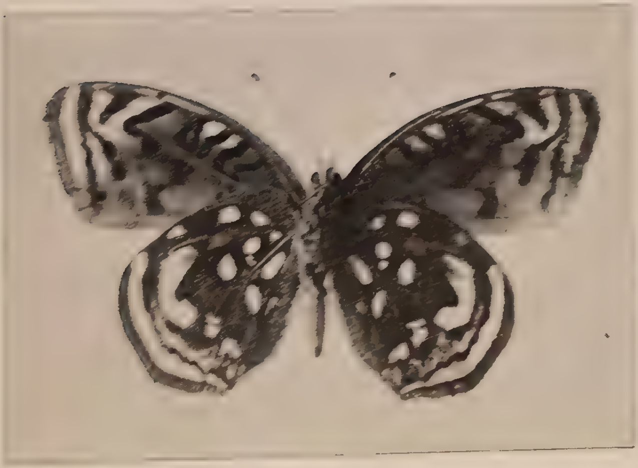
Fig. 1. *Argynnis cybele* Fabr., forma *bartschi* Reiff. Wing venation.

Now what is the cause of this peculiar aberration? At first I thought that I could consider it as a mutation, produced by some external influence, until I carefully examined the venation. Then I found that it was a "peroneurous aberration," *i. e.*, an aberration, which is produced by the absence of one or more veins or parts of veins. The expression "peroneurous aberration" was created by Professor Spengel of Giessen (Germany), from the Greek πηρός-aborted. A short time ago I described a "peroneurous aberration" of *Papilio machaon* in a paper which will appear in the next issue of the "Zeitschrift für wissenschaftliche Insekten Biologie." In the accompanying drawing I represent the venation of the *Argynnis*. The venation in the two pairs of wings is similar. In comparing this drawing with the two photographs it will be seen that upon all those parts of the wings where the veins are present in a normal form, the markings are also normal. This is shown most clearly upon the base of the underside of the hind wings. All those parts of the wings, however, from which the venation is absent, are aberratively modified, the modification increasing as we pass towards the border of the wings. In a normal *cybele* wing, the black, yellow and silver markings are separated in more or less distinct isolated spots and points in consequence of the venation, while in the specimen under consideration all the rows of spots fuse to form complete bands on the parts where the venation is absent. The drawing and the photographs show that the form must have been produced in the manner just described. Moreover, the abnormal shape of the wings may also be traced to the partly missing venation, as the wings, of course, were arrested in their development on those parts which had no complete veins.

This examination also explains why Mr. Bartsch captured damaged specimens, since a butterfly, which lacks almost every vein beyond the middle portion of the wings, is inevitably liable to the danger of injuring its wings upon its first attempt to fly, because it exposes to the resistance of the air a large part of the surface of its wings which is devoid of every support. If the butterfly is struck by a gust of wind, or its wings occasionally strike against branches or leaves, the injury to the specimen will soon be complete. Our specimen, which was restored only after considerable careful work, had suffered most from a damage of the fore wings.

According to Mr. Bartsch's statements, the flight of this form differs considerably from the flight of the normal *Argynnis cybele* which occurs in large numbers in the same locality. He says it has a quick but more wavering flight, and that any flying specimen of the aberration can be readily noticed. The fact that in a single day in 1907 Mr. Bartsch caught three specimens of this form, induced me to try my luck during the past summer in the same locality. But on both days when I began to collect there the weather was so unfavorable that Lepidoptera would not fly. Mr. Bartsch was more fortunate, as he succeeded in capturing another specimen of the same form in the same locality this year,





[illegible] ARGYNNIS CYBELE FABR. FORMA [illegible]

but it was a badly mangled individual. It would seem, therefore, that this form is not so very rare in this locality, although we should expect it to be very scarce on account of the peculiarity of its origin. Of the peroneurous *Papilio machaon* aberration, above mentioned, I secured two specimens from only 75 pupæ, which is also a proof that peroneurous aberrations can develop with comparative ease, though the conditions for such development are still unknown.

Mr. Bartsch very generously presented me with the interesting specimen of Argynnis and I have placed it in the collection of the Bussey Institution. In honor of the discoverer I would name this peroneurous aberration, *Argynnis cybele* Fabr. forma *Bartschi.* Its diagnosis would be the following:

Alarum venæ post mediam ad extremam partim immaturæ vel obsoletæ; propterea macularum seriebus omnibus in vittis confluentibus; ubivis venæ partim vel omnino obsoletæ sunt. Alæ contractæ, propterea aspectu aliquantum productæ.

Type: 1 ♂ in the collection of the Bussey Institution.

GEOMETRID NOTES.

A NEW VARIETY OF NYCTOBIA.

By L. W. Swett.

Boston, Mass.

Nyctobia limitaria Walk., **reiffi** var. nov.

Exp. 25 mm., palpi short, white typed body and thorax ash gray, antennæ black and white ringed. Fore wings ash gray, first a reddish brown basal band running outward below costa in a strong curve to median vein where it recurves to inner margin. Beyond this is a pale gray space 3 mm. wide where there is a broad chestnut brown band running from costa to inner margin, the inner edge of which is very irregular, the black linear discal spot is just visible, the extra discal edge of this band is bent outwards below costa at discal spot and inward towards inner margin, beyond this the wing is pale ash and two faint brown hair lines run brokenly to inner margin. Twin dots at ends of veins in the long ashen gray fringe. Hind wings light ash with a faint extra discal brown band, below which the wing is lighter. The fore wings beneath are light ashen with band showing through faintly the discal dot is black, and appears on hind wings also, which are same as fore wings only there is a trace of two bands beyond discal spot. This variety can be told at a glance by the striking red-brown band across fore wings making it resemble slightly Xanthorliöe ferrugata.

This beautiful variety was given me by my kind friend, Mr. William Reiff, who took it in Forest Hills on the hemlock, together with two intermediate forms of the same variety.

Type: 1 ♀; April 5, 1910, Forest Hills, Mass.

ETHOLOGICAL NOTES ON *ELAPHRUS CICATRICOSUS* LEC. (COLEOPTERA)

By C. A. Frost.

A few words on the occurrence of this rare species of Carabidæ may enable some other collector to profit by my experience if they have plenty of time and patience.

My first specimen was taken at Monmouth, Me., in 1907 (about June 20) on the shore of a lake near the mouth of a small brook. I was sifting a pile of washed-up debris for Staphylinidæ when I noticed it running on the mud near where I had been standing. A careful search failed to discover any more at that time and each summer since, although I have even dammed up the brook in the hope of flooding out a specimen. The cause of its disappearance in this place is probably the removal of a heavy growth of alders that extended down to the edge of the water.

On June 23, 1910, after working this locality in vain, it occurred to me to explore a cold swamp about a mile further up the lake. This swamp, which is never dry, is traversed by a clear trout brook fed by springs and it is so heavily wooded that the sunshine penetrates into it hardly at all. In some places the mud is very deep and is covered more or less thickly with swamp grasses, dead limbs and logs.

I began operations here with a rusty pint dipper which I picked up at the spring, and almost the first dipperful of water brought out a specimen of Elaphrus from a slight hollow near the brook. It was *cicatricosus*, and for an hour or more I worked the old dipper–until the bottom fell out–without success. I now think that the first specimen was driven out by stepping on a piece of stick that was partly buried in the mud. This method of throwing water is usually very successful in driving out specimens of Heterocerus, Staphylinidæ, Bembidium and other Carabidæ, but has not worked very well with any Elaphrus except *ruscarius*.

After the dipper gave out I began treading around all the likely looking places along the brook and before long drove two specimens out at once. These were the last seen although I continued the work until the approach of darkness put an end to the hunt which proved also to be the last one in this locality for the summer. The success of the three hours hard and careful work in this ideal haunt of *cicatricosus* shows that it is either very rare or the season was not right for it.

The first specimen taken in Massachusetts was at Sherborn on May 10, 1908, and was driven out by suddenly letting water from a flooded cranberry bog down the bed of a small brook. Two more specimens were taken here in the same way May 15, 1910. The bed of this brook is shaded by bushes and alders at the place where they were found and is wet and muddy until late summer when it entirely dries out. All efforts to find specimens here at other times have failed.

It may be of interest to note that five specimens of *Elaphrus clairvillei* Kirby were taken in the densely shaded bed of a brook which, although it attains a fairly large size in the spring months, was then dry and grown up to grass and weeds. This was on September 6, 1907. The specimens were disturbed by the feet of a party of surveyors and were discovered where the grass had been removed. All persuasive methods known to me failed to induce specimens to appear in this place until August 27, 1910, when I secured three of them by removing the grass and driving a trowel into the ground at short intervals. They would suddenly appear and remain motionless until an attempt was made to pick then up. I do not know whether they came out of the ground (which was filled with holes like those made by a woodcock), or were simply hiding in the grass, but I am rather inclined to accept the former alternative.

REVIEWS.

W. S. Blatchley. The Coleoptera or Beetles of Indiana. Bull. Indiana Dept. Geol. and Nat. Resources, No. 1.

To quote from the author, this work has been prepared "not for specialists . . . but for beginners," he modestly disclaiming an exhaustive treatment of the field covered and fully realizing that many other species will yet be recognized in his State.

A bulky volume of 1380 pages is devoted to the Coleoptera Genuina, the treatment of the Rhynchophora being reserved for future accomplishment.

Analytical keys to genera and species and brief descriptions of Indiana species known are given and such other species as have been taken in the adjoining regions are included in the keys and noticed in the text. To save space no attempt is made to print matters relating to synonymy, but the place of original description of every species is noted and quite full references are given to the various memoirs that have appeared treating of different groups. Of these latter the author has made free use so that his volume fairly reflects the present condition of the science in this country. Numerous figures, copied and original, enliven the pages and add much interest. At the end of the volume is a glossary of terms used and an index to families and genera.

Mr. A. B. Wolcott has contributed the text of the Cleridæ with fourteen original cuts. In the course of the volume 80 new species are described and one new genus, *Blanchardia* allied to *Omethes*. This generic term and others of similar derivation in honor of the French entomologist have been so often used that it will be necessary to provide another name for the genus.

Besides the usefulness of such a work to the less advanced student there is much to interest the most experienced; the many original observations, the new characters used to define species and as a faunal list; and to us it seems that the "Bulletin No. 1 of the Indiana Department of Geology and Natural Resources" is quite worth the while for the great State of Indiana to assume the publication.

Frederick Blanchard.

PSYCHE.

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